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C4I: WEAPON OR ACHILLES' HEEL ???

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Joint Military Operations Department.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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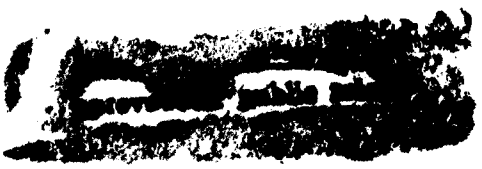

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Today Command, Control, Communications, Computers and Intelligence (C4I) is considered by some to be a force multiplier and by others to be a weapons system unto itself. C4I is no longer simply a supporting system for the commander - especially for the theater commander. This paper explores the increasing level of importance of C4I to the combatant commander using lessons learned from Operations URGENT FURY (1983) and DESERT SHIELD/DESERT STORM (1990-1991). These operations vividly demonstrate past difficulties and recent improvements in joint operations, improvements many would argue are largely attributable to the enactment of the Goldwater-Nichols Department of Defense Reorganization Act of 1986. Unfortunately, these same operations reveal that many problems continue to exist. The explanation for these continuing problems is explored through an examination of the varying roles and views of the key players involved in both developing and using C4I systems. As is shown, the process is anything but clear. Also included is a discussion on the people side of the C4I equation--an area which rarely receives the focus it needs, yet is key to the entire process. Unless one agency is given the mission to develop and (Continued)

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Today Command, Control, Communications, Computers and Intelligence (C^4I) is considered by some to be a force multiplier and by others to be a weapons system unto itself. C^4I is no longer simply a supporting system for the commander - especially for the theater commander. This paper explores the increasing level of importance of C^4I to the combatant commander using lessons learned from Operations URGENT FURY (1983) and DESERT SHIELD/DESERT STORM (1990-1991). These operations vividly demonstrate past difficulties and recent improvements in joint operations, improvements many would argue are largely attributable to the enactment of the Goldwater-Nichols Department of Defense Reorganization Act of 1986. Unfortunately, these same operations reveal that many problems continue to exist. The explanation for these continuing problems is explored through an examination of the varying roles and views of the key players involved in both developing and using C^4I systems. As is shown, the process is anything but clear. Also included is a discussion on the people side of the C^4I equation -- an area which rarely receives the focus it needs, yet is key to the entire process. Unless one agency is given the mission to develop and field all DOD C^4I systems (considered highly unlikely), a joint initiative to standardize C^4I training becomes imperative.

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CHAPTER I

INTRODUCTION

> Throughout history, military organizations have been confronted with a tension between constancy ard change- the constant requirement to field and control effective combat forces and the changing technology to accomplish that task. Nowhere has the dynamic tension between constancy and change been more pressing than in the area of command, control and communications. The needs of the ground commander to control and coordinate forces have changed very little in history. Yet, today's technology offers unique opportunities and unprecedented challenges.
>
> The United States will never send forces from just a single military service to major combat in the future. All future major combat operations will combine the capabilities of each of the military departments under the joint combatant commanders.[1]
>
> Senator Sam Nunn
> Chairman, SASC

Background. Even in the times of Sun Tzu and Clausewitz, the successful application of principles of war required the application of good command, control, communications and intelligence (C^3I). Commanders in the field needed to know the strengths, weaknesses, and dispositions of their enemy (intelligence factors), and they needed to be able to communicate with both their superiors and their subordinates in order to effectively capitalize on developments on the battlefield. The commander could not apply the principle of

mass at the decisive time and place if he could not communicate with his forces when necessary. Unfortunately, technology had not yet evolved sufficiently to provide the commander in Sun Tzu's or Clausewitz's time with the tools he needed to fully exploit the principles of war. Instead of employing envelopments and maneuver, massive numbers of troops were used in frontal assaults. Resulting heavy casualties were the order of the day. Even as late as World War I opposing forces were still involved in massive frontal assaults. The principles of war had remained the same, but the technology employed by warfighters (tanks, machine guns, artillery, gas) had exponentially raised the level of death and destruction.

Evolution. Today the commander is faced with the task of applying many of the same principles of war as those developed and espoused centuries ago by Sun Tzu and Clausewitz. Only today the environment is much more complex and the potential results much more deadly. Fortunately, today's commander has many more capabilities in his tool bag to enhance his success. These force multipliers provide the commander with both a clearer picture of the battlefield and the means through which to defeat the enemy -- controlling his forces, concentrating firepower and capitalizing on the enemy's weaknesses. Warfare today involves the use of space systems, high speed communications and imagery systems, expert information

systems, remote sensors, standoff precision guided weapons, and potentially even weapons of mass destruction. And the list goes on! For the theater commander, the successful application of these awesome capabilities (or defense against them) requires the effective integration of complex systems in a manner which supports all levels of command, all types of operations, and spans the boundaries of all Services. To do this the commander must be aware of the strengths and limitations of these systems and be able to influence their future development and employment.

No longer will United States forces be employed as separate services in response to major regional problems. Consequently, it is vitally important for the systems of the Services to fully support their needs as well as the needs of the theater commander. Integration must be both lateral and vertical. Whether the challenge is to evacuate and protect American citizens in Grenada or to restore to power the rightful government of an ally as in Operations DESERT SHIELD and DESERT STORM, the combined efforts and capabilities of all United States forces -- including allies -- will be employed.

Scope. Command, control, communications, computers and intelligence (C^4I) is the supporting system through which the commander exercises both command and control of his forces.[2] It is the means through which Clausewitz's "fog of war"[3] is lifted and through which the commander employs his troops.

By discussing the lessons learned from Operation URGENT FURY in Grenada and Operations DESERT SHIELD and DESERT STORM in Southwest Asia we will demonstrate some of the C⁴I related problems of the past, along with some of the actions taken to prevent them in the future. Further, we will explore the complex process through which C⁴I systems are developed and fielded, examine the seemingly conflicting roles of the various players, and identify some of the "holes" which still exist within the process used by the Department of Defense (DOD) to field and employ C⁴I systems. We will address areas of concern to the theater commander in the development and fielding of C⁴I systems and in the training of C⁴I personnel. The focus of this paper is necessarily limited to the supporting role C⁴I systems provides to the theater commander. It does not attempt to address the larger and more generic subject of command and control except for where C⁴I systems provide critical support.

CHAPTER II

URGENT FURY TO DESERT STORM
The Genesis and Impact of Goldwater-Nichols

On October 25, 1983 elements of the U. S. Army, Navy, Air Force and Marine Corps assaulted the island of Grenada in the Caribbean. The operation, code named URGENT FURY, must be viewed as a success. The principle missions - the rescue of the American medical students, the restoration of democracy and the expulsion of Cuban forces - were accomplished rapidly and with relatively little loss of life (18 U. S. servicemen killed and 116 wounded).[4]

Grenada: Operation URGENT FURY. On the small island country of Grenada, known to but a few Americans, the United States employed overwhelming force against a decisively lesser capable and lesser trained opponent. Operation URGENT FURY, although classified "a success," has been the subject of numerous studies, after-action reports and countless hours of congressional hearings. Common to all of these reviews were reports of major problems in interoperability and in training between the Services. Although the problems spanned all functional areas, a focus on the major and most often quoted C^3I related concerns include:

- the lack of understanding by senior commanders of all Services about the equipment, tactics, and abilities of their sister Services. This seriously impacted on the Commander Joint Task Force's (CJTF) ability to integrate and employ the

separate Services efficiently and effectively.[5]

- poor communications existed between all of the Services. Incompatible equipment and uncoordinated radio frequencies seriously impacted the Army's ability to employ needed air and naval gunfire support, the Marines' ability to provide timely armor support to nearby Army units,[6] and even the ability of the CJTF to provide Army units on the ground with precise data on the location of all American medical students to be rescued.[7]

- insufficient satellite communication circuits were provided to the task force. As a result, multiple units were forced to "share" the one secure voice circuit which was provided.

- inadequate intelligence data was provided to the task force. Specifically, the location and strength of enemy forces, location of all Americans to be rescued, and adequate maps of Grenada were not provided at the start of the operation. Further, inadequate communications impacted on the distribution of intelligence data when it did become available, reportedly requiring maps to be flown to Grenada vice being sent electronically.[8]

The lessons learned from Operation URGENT FURY notably included the need for improved equipment and systems interoperability, increased unification of efforts and planning between the Services, expanded intelligence

distribution systems, and more realistic joint exercises (particularly for communications).[9] The Services up to this point focused their doctrine and development efforts along service lines with little consideration given to operating with each other. This single-service attitude notably impacted on the service members as well as the equipment fielded. When forced to operate in a joint environment the capabilities and languages of each of the Services were often as foreign as their equipment was incapable of interoperability.

Goldwater-Nichols. After over two years of testimony, debate and study, the Congress passed the Goldwater-Nichols Department of Defense Reorganization Act of 1986. This wide-sweeping legislation was designed to:

> ... strengthen civilian control and oversight of military operations; improve the military advice provided to civilian authority; establish the Chairman, Joint Chiefs of Staff (CJCS) as the principal military advisor to the National Command Authorities; and place clear responsibility on combatant commanders while ensuring the Commanders-in-Chief's (CINC) authority was commensurate with their responsibilities.[10]

The Goldwater-Nichols legislation strengthened the importance of jointness in terms of training, assignment and promotion of personnel, and interoperability.[11] The focus for the Services changed from that of functioning in a single-service environment to that of multi-service, even multi-

nation environment. The impact (addressed more fully in Chapter III) greatly improved the functioning of the DOD as a whole. Importantly, it helped blend the efforts of the Services with the combatant commanders.

Operations DESERT SHIELD/DESERT STORM. What has the impact of the Goldwater-Nichols legislation been? The immediate answer may be best seen by reviewing the lessons learned from Operations DESERT SHIELD and DESERT STORM. After less than five years since the Goldwater-Nichols legislation was passed the United States was engaged in a major regional conflict which involved the employment of both joint and combined forces.

The magnitude of this operation fully exercised all aspects of C^{4}I. For starters the size and complexity of the C^3 system established to support tne coalition forces during DESERT SHIELD and DESERT STORM was reportedly the largest and most diverse system in history.[12] Three generations of tactical equipment from multiple services, and even multiple nations, were effectively integrated. Satellites, personal computers, faxes, Global Positioning System (GPS) terminals and secure phones represent just a small sample of the technology employed to support the command and control process.[13] According to General H. Norman Schwarzkopf, Commander-in Chief (CINC) Central Command during DESERT SHIELD and DESERT STORM "Our superiority in precision munitions, stealth, mobility,

and command, control, communications and computers proved to be decisive force multipliers."[14]

In spite of these successes there continued to be problems in vital areas. First, the Services employed C^{4}I technology which was behind that readily available in the commercial world.[15] Major improvements in communications, computer work stations, distributed data bases and intelligent (expert) systems made much of what the Services used nearly obsolete. Second, intelligence dissemination and communication capacity problems continued to haunt the coalition forces. As an example of the intelligence dissemination problem one only has to read the DOD's after action report on the Gulf War. In this report the lack of compatible and equivalent intelligence capabilities amongst the Services resulted in theater-wide gaps and inconsistencies. While General Schwarzkopf was reportedly provided with adequate intelligence at the strategic level, the majority of commanders at the tactical level (Division, Wing and below) were not satisfied.[16] A closer examination of the intelligence problem reveals that it was both a function of inadequate communications support (the same as in URGENT FURY) and the fielding of a variety of systems with different capabilities by the Services.[17]

Another vivid example of insufficient communication capacity amongst the forces showed up during the daily development and transmission of the Air Tasking Order (ATO). The Navy lacked sufficient satellite communications capacity aboard her ships

to support the electronic transmission of the ATO. The solution was to employ aircraft to courier diskettes containing the ATO to the carriers for copying and further dissemination.[18]

Both the ATO and intelligence problems previously noted are easily solvable using existing technology. The key is for the entire C⁴I system to be fully integrated and designed from the top down to support both the theater commander and his forces. Without this integration the commander's ability to fully utilize all the capabilities of the forces at his disposal is severely limited.

CHAPTER III

THE PLAYERS AND THEIR ROLES

> In a nutshell, the issue was this: the services had institutional expertise and procurement responsibility (that is, programs and money) for command and control systems, but only a secondary interest in systems that crossed service lines; the JCS had primary interest in joint command and control, but neither the responsibility nor the money for procurement of such systems; the unified and specified commands had all the responsibility for the nation's combatant forces (and arguably much of the expertise as well), but no money either to procure new items or to fine-tune what was in place; finally, OSD had none of the operational expertise and only incomplete control over procurement, but complete responsibility for anything that anyone did or failed to do anywhere in the system.[19]

Joint Focus - Opposing Needs? The above quote from C. Kenneth Allard's book Command, Control, and the Common Defense clearly describes the situation which existed before the landmark Goldwater-Nichols Department of Defense Reorganization Act of 1986. Since then much has changed to improve the joint focus of the Services and the DOD. The question today is not whether future operations will be joint, only how can this goal be best achieved -- especially when it comes to the development and fielding of C^{4}I systems.

There are numerous players which impact the process of developing and fielding C^{4}I systems. These players, which notably include the Services, the Joint Staff, the Combatant Commanders, the DOD Agencies, and even Congress, come to the "table" with different views and responsibilities -- each of

which are valid and needed. Unfortunately, as the players exercise their responsibilities the process becomes more and more difficult to follow.

The matrix below is provided to demonstrate some of the differences which exist between those responsible for force planning (the Services -- tasked with training and equipping forces) and those responsible for operational planning (the operational CINCs -- tasked with employing assigned forces). Clearly the focus of the CINCs is on the here and now, while the focus of the Services is on the future.[20]

Force Planning Compared to Operational Planning

Item	Force Planning	Operational Planning
Purpose	Structuring Forces	Fighting Forces
Orientation	Global/Regional	Theater/Local
Input	Future	Existing
	Forces	Forces
	Threats	Threats
	Objectives	Objectives
	Strategies	Strategies
	Risks	Risks
Output	Planned and Programmed Forces	Contingency War Plans
Biases	Development	Deployment
	Modernization	Employment
	Force Structure	Readiness
		Sustainability

Source: Henry C. Bartlett, "Approaches to Force Planning," Force Planning Faculty, Naval War College, ed., FUNDAMENTALS OF FORCE PLANNING VOL I: CONCEPTS (Newport: Naval War College Press, 1990), p. 446. The above matrix is adapted from one developed by Colonel William O. Staudenmaier, USA, in "Strategic Concepts for the 1980s: Part I," Military Review, March 1982, p. 45.

The challenge is not as simple as the above table implies. To deduce from the above that the Services are only concerned with the future or that the CINCs are only concerned with the present would be a gross error. The concerns of the CINCs and the Services encompass both the present and the future, its just their principal focus that is different.

The CINCs' Views. A further examination of the separate CINC's responsibilities reveals even more differences. For example, the focus of the CINC responsible for Europe might very well be concerned with ensuring that C⁴I systems fielded allow him to interface with his North Atlantic Treaty Organization (NATO) allies. This will enable him to capitalize on Europe's well developed infrastructure while also improving his ability to operate in a combined operation. The goal might be somewhat different for the CINC responsible for Central and South America. He is faced with an environment which is largely underdeveloped. Hence, he might be concerned with the fielding of C⁴I systems capable of supporting all of his requirements, notably including long haul communication systems. The CINC responsible for special operations might have yet another set of requirements, notably including systems which support small unit communications and real time intelligence dissemination.[21] The issue is not that one CINC is right and the other wrong in his approach to C⁴I. The issue is that their varying missions and the state of

their areas of responsibility dictate where their focus must be. In general terms they all need systems which are interoperable, reliable and effective. In specific terms this equates to something which may be different for each since no one system as of yet can be all things to all people.

The Services' Perspectives. Much like the CINCs' varying views towards what C⁴I should look like the Services also each see C⁴I through a different set of lenses. Granted all will agree that C⁴I systems need to support both joint and combined operations. All will also probably agree that the C⁴I systems must enable them to pass information between land, sea, and air forces. But again, much like the individual CINCs, each of the Services have different requirements based on their unique missions.

In Command, Control, and the Common Defense, Allard presents an excellent discussion by General Paul Gorman of the varying C⁴I needs of the Services. General Gorman tries to simplify the requirements by pointing out the differences between the Services in terms of military operations. Specifically, he tries to quantify the command and control problem by identifying the number of ships, planes, tanks, battalions, or similar groups of personnel which would be commanded by a three star general or admiral from the several Services. According to this argument the Navy Vice Admiral would be concerned with from 10 to 100 ships, planes, submarines; the

Air Force Lieutenant General would be concerned with from 100 to 1,000 planes; and the Army and Marine commanders would be concerned with controlling separate units down to the platoon and squad level of 1,000 to 100,000 or more.[22] The point General Gorman makes is that the Navy, in contrast to the Army, has a much smaller number of subordinate units to directly control.

Allard rightfully recognizes that a comparison of sheer numbers does not properly define the separate challenges of the Services. The Navy for example has to field systems which are fully integrated. In this example a carrier is a weapons platform which must be able to use C^4I to communicate with higher headquarters and the members of its task force (its aircraft, supporting and covering ships, land forces ashore). Further, the carrier must be able to detect and engage incoming enemy forces (ships, submarines, planes, missiles) at great distances. Importantly, the integration of this system must ensure that each subsystem or upgrade does not interfere with the other components of the system as a whole. Consequently, C^4I modernization efforts within the Navy are often times more complex and expensive then those of its sister Services.

There are also differences in the environments in which the Services must operate. The Navy, much like the Air Force, has to be able to control forces over a vast distance. The Army and the Marine Corps, on the other hand, usually will

operate in a more contracted environment. The distance is less but they are often required to operate in dense jungles or in mountainous terrains.[23] With each environment comes its own set of challenges. The expertise of the Services make them best equipped to recognize these challenges and to develop the needed solutions.

A Balanced Solution. The goal is to find the right balance between the Services' and the CINCs' C⁴I needs. This is no small task given the varying perspectives and focuses of the players involved. Add to this mixture the issue of decreasing budgets, changing force structures, and politics, and you end up with a formidable task. There are simply not enough resources (especially dollars) to satisfy everyone's perceived needs. The solution is not only cooperation amongst the players, but a system of checks and balances which ensure that all pieces of the puzzle come together as designed.

The CINCs have considerable influence on the C⁴I systems being developed. The CINCs' mechanisms now include: being able to comment directly on service Program Objective Memorandums (POM); submitting their own integrated priority lists (IPL's); submitting exercise reports identifying C⁴I deficiencies; submitting an annual Command and Control (C^2) Master Plan; and, defining their own requirements.[24] Further, the Vice Chairman of the Joint Chiefs of Staff (VJCS) is now tasked to sit as the Vice Chairman of the Defense Acquisition

Board (DAB) and as the Chairman of the Joint Requirements Oversight Council (JROC). In these key positions the VJCS's role is to represent the needs of the CINCs along with the appropriate level Service influence.[25] Many of these changes are the result of the enactment of the Goldwater-Nichols legislation, recognizing the need to improve the DOD's focus on jointness and on the CINCs' requirements as a warfighter.

Without properly balancing the CINCs' needs with those of the Services the potential now exists for the needs of the CINCs to override the needs of the Services. The Services, for example, might be forced to spend an inordinate amount of dollars on long haul C^{4}I systems to provide information and intelligence from national and coalition forces to the CINC. While this is no doubt important, is it more important than providing the needed C^{4}I systems to ensure that this information is provided down to the tactical commander and below? Still further, what if a joint system is developed which would support the tactical commanders needs but is not funded and supported by all of the Services? What if the Army funds this system and the Marine Corps does not? The Marine Corps might rightfully determine that their priority is to invest in a C^{4}I system that supports their "... From the Sea" concept. What if the Marine Corps decides to invest in mechanized vehicles vice C^{4}I? For the CINC the obvious implication is that each of his forces may have a different set of capabilities. This is important as he develops his

theater intelligence dissemination plan and his C^2 Master Plan.

It is also important to recognize that different is not necessarily bad. If we liken the commander's overall requirement to the construction of a table we see that the legs of the table (one for each of the Services) do not have to be the same style for the table to both functional and stable. Much is same for our future C'I systems. Individual systems may be different provided they are interoperable and support both Service and CINC requirements.

CHAPTER IV

PEOPLE - THE MISSING LINK?
Merging of Computer and Communication Specialties

The People. Chapter III's discussion of the roles and responsibilities of those involved in the development and fielding of C⁴I systems vividly describes a process that is riddled with pitfalls. The Services identify and buy systems, the CINCs identify needs and comment on proposed buys, and the Joint Staff tries to referee between the positions taken by the Services and the CINCs. Clearly the key to making this process work is people -- knowledgeable and well trained professionals who can help make sure that the systems developed are visionary and capable of supporting both Service and CINC requirements. Unfortunately each of the Services approach the training and assignment of their C⁴I personnel with their own views and beliefs. The result is C⁴I personnel between the Services with wide varying degrees of experience and expertise.

Focusing on the C⁴ portion of the C⁴I community, recent changes in technology have forced the Services to rethink the training and assignment of their communications and computer personnel. The Air Force, for example, recognized several years ago the need to combine the training and assignment of its communications and computer personnel.[26] The Air Force correctly recognized that what used to be clearly separate

fields of study has become blurred with advances in technology and increased reliance on software and computer centers to perform both processing and communication functions. The other Services have also recognized the need to marry the expertise and training of these two specialties, but have chosen different paths through which to accomplish this. The Marine Corps and the Navy have implemented the S-6/G-6/N-6 organization at all battalion/squadron and higher level staffs. This staff section is responsible for the oversight and direction of the communications and computer fields. For the Marine Corps these billets are filled by individuals with either a communication or computer specialty. The Navy, however, often uses personnel from other specialties to head its communication departments. For example, it would not be unusual for a P-3 pilot to be placed in charge of a communications department aboard a carrier.[27] The Army also recognizes the need to train its personnel in both computers and communication and attempts to accomplish this in its Signal Branch.[28]

What is clear is that each of the Services recognize that the communications and computer fields are evolving into one. What is also clear is that each of the Services have taken a different path towards accomplishing this merger. None of the Services appear to have developed a comprehensive training program which ensures that its personnel, particularly those at the officer level, are competent in both communications and

computers. Even the Air Force, which has officially combined these two fields, has not yet revamped their school curriculums to fully address both areas of study.[29] Without formal education maintaining competency and currency in these rapid changing fields will be haphazard at best.

The Impact. The Services need personnel experienced and trained in both communications and computers (and potentially intelligence?), especially given the convoluted and disjointed method employed by the DOD to develop and field C^{4}I systems. The Services need personnel with the vision and the expertise to capitalize on the latest technology in satisfying the commander's battlefield information requirements with systems which are cost-effective and capable of supporting both Service and CINC requirements. Importantly, if these systems are to be seen as force-multipliers they must be capable of doing more than just lifting the "fog of war". They must enable the commander to see the battlefield clearly and to effectively control his forces and weapon systems. To accomplish this C^{4}I personnel need to be both technically and tactically proficient.

The Joint Staff is also critically dependent on well trained C^{4}I personnel to put together visionary programs such as C4I for the Warrior[30] to guide the Services into the next generation of capabilities, analyze CINC C^2 Master Plans and IPLs, and resolve disagreements between the Services and the

CINCs on POMs -- and maybe to even recognize the need to develop an umbrella concept for joint C⁴I training to guide the Services into the future.

For the CINCs the need for well trained C⁴I professionals is arguably the greatest. As the combatant commander the CINCs need to be able to effectively analyze Service POMs and identify gaps in planned C⁴I systems. Most importantly, the CINC's C⁴I staff needs to be capable of placing the "square pegs" developed by the Services into the "round holes" needed by the CINC so that an effective C^2 Master Plan is the result. With limited funding to support the replacement and modernization of existing C⁴I technology future conflicts will no doubt involve multiple generations of equipment fielded to different levels by the various Services -- similar to what was seen in Operation Desert Storm. It will be the people who will serve as the key link in the chain needed to pull the system together.

CHAPTER V

WHAT DOES IT ALL MEAN?

Conclusions. As the military services downsize they will continue to rely on technology to serve as a force multiplier. No where is this more important than in the C⁴I arena where the systems fielded have the potential to change the face of the battlefield. Unfortunately the process used by the DOD to define requirements is slow, complex, and riddled with pitfalls. Instead of employing a top-down, structured approach to fielding needed C⁴I systems the DOD allows the individual Services the freedom to determine what systems they need to procure. The CINCs and the Joint Staff attempt to influence this process but are not always successful. The end result is potentially a significant difference in C⁴I capabilities between the Services, and consequently, a conglomeration of systems for the combatant commander to attempt to blend into an effective C^2 Master Plan.

The key to making the existing process work is people who are well trained and experienced. Unfortunately the process used by the Services to train and grow their C⁴I specialists is as disjointed as the process used to purchase their systems. While this provides the Services with the ability to best meet their Service needs it arguably falls short of providing the combatant commander with trained C⁴I professionals.

Recommendations. The solution to the disjointed method of fielding C⁴I systems is really quite simple. As one officer recommended one agency should be given the responsibility, authority and funding to procure all of C⁴I systems for the DOD. This would allow for a structured approach which hopefully would meet both the combatant commanders' and the Services' needs.[31] Unfortunately, wrestling away this power from the Services is probably not yet achievable.

If the existing process of fielding C⁴I systems is to continue, which appears likely, its success is dependent on the people involved. A study should be conducted by the DOD to determine how best to train the Services' C⁴I personnel so that they are fully capable of supporting Service and Joint requirements.

NOTES

1. Clarence E. McKnight, ed., Control of Joint Forces: A New Perspective (Fairfax, VA: AFCEA International Press, 1989), p. vii.

2. The Joint Staff Officer's Guide (Washington: Armed Forces Staff College. U. S. Government Printing Office, 1993), p. 5-24.

3. Michael Howard and Peter Paret, ed., Carl Von Clausewitz ON WAR (Princeton, NJ: Princeton University Press, 1984), p. 101.

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6. Stephen E. Annos and William E. Einspahr, "Command and Control and Communications Lessons Learned: Iranian Rescue, Falklands Conflict, Grenada Invasion, Libya Raid," Air War College Research Report, No. AU-AWC-88-043, Air University, United States Air Force, Maxwell Air Force Base, Alabama, pp 41-47. (Note: This source was used extensively in identifying the problems and lessons learned listed in this paper.)

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12. Conduct of the Persian Gulf War, p. 559-560.

13. Ibid., p. 559-575.

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20. Jerry O. Tuttle, "CINCs' Impact on C^3 Systems Planning and Acquisition," Clarence E. McKnight, ed., CONTROL OF JOINT FORCES: A New Perspective (Fairfax: AFCEA International Press, 1989), pp. 117-121.

21. McKnight, ed., pp. 122-171. McKnight presents numerous articles from the various CINC's which highlight their different focuses on C3I. These articles are the primary source for the above discussion and may be referred to for a more detailed discussion of this issue.

22. C. Kenneth Allard, Command, Control, and the Common Defense (New Haven: Yale University Press, 1990), pp. 154-168. This section is used to support the discussion on the Services' Perspectives.

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28. Interview with S. P. Kinder, Student, U. S. Naval War College, Newport, RI: 9 May 1994.

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